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A preliminary survey of the montane avifauna of Mt Nilo, East Usambaras, Tanzania

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Nilo Forest Reserve (FR), which encircles the peak of Mt Nilo in the East Usambara Mountains, Tanzania, comprises an area of 5872 ha. This reserve, reaching *c.* 1500 m, is the highest in the East Usambaras and has been comparatively neglected ornithologically. This site was visited in August 1994 and again, albeit for only a few hours, in October 1996. The prime objective was to locate globally threatened birds and other restricted-range species. The Tanzanian Mountain Weaver *Ploceus nicolli* was relocated in the East Usambaras, the first record in over 60 years. Other globally threatened or near-threatened species found at this locality include the Southern Banded Snake Eagle *Circaetus fasciolatus*, Fischer's Turaco *Tauraco fischeri*, Usambara Eagle Owl *Bubo vosseleri*, Long-billed Apalis *Apalis moreaui*, Banded Green Sunbird *Anthreptes rubritorques* and Amani Sunbird *A. pallidigaster*. In addition, the African Hill Babbler *Pseudalcippe abyssinica* was recorded in the East Usambaras for the first time. Nilo FR is now known to be an important site, both in the Usambaras and globally, for the conservation of birds. The East Usambara Catchment Forest Project has made great efforts to protect forests in the East Usambaras, including Nilo FR, through a variety of measures. However, the pressure for arable land appears to be a growing problem in the area; due to the habitat degradation occurring in the adjacent public land forest, future attention for land and other socio-economic needs may focus on the better protected forest reserve.

Background on the Usambaras

The Usambara Mountains, situated in northeastern Tanzania, are part of the Eastern Arc chain of mountains that run from southeastern Kenya to southern Tanzania. These mountains contain forests that are characterized by high species endemicity for most biota (e.g. Rodgers & Homewood 1982, Lovett & Wasser 1993).

During the period of European exploration in East Africa, various German scientists working in Tanzania acknowledged the biological importance of the Usambaras (e.g. Engler 1894, Rodgers & Homewood 1982). These and other researchers documented a high species diversity and endemism for invertebrates, amphibians, reptiles and plants (see relevant chapters in Lovett & Wasser 1993). In addition, there is one known endemic bird species (Stuart *et al.* 1993).

Despite considerable work on the avifauna of the Usambaras, only some parts of the East Usambaras have been well studied, principally in the vicinity of Amani (Friedmann 1928, Sclater & Moreau 1932–33, Moreau 1935, Ripley & Heinrich 1966, Stuart & Hutton 1978, Turner 1978, Stuart & van der Willigen 1979, Stuart 1983, 1989, Newmark 1991, 1993) and, more recently, Mt Mtai (Evans & Anderson 1992, 1993) and some East Usambara lowland sites (Evans *et al.* 1994, Hipkiss *et al.* 1994, Cambridge Tanzania Rainforest Project 1994). These last studies added three globally threatened forest birds to the East Usambara avifauna and clearly indicated both the remarkable conservation importance of this range and the need for further investigations.

Since the avifauna up to *c.* 1100 m in the East Usambaras was reasonably well known, it was considered important to survey the forest above this altitude in Nilo FR,

which is the highest point in the East Usambaras at 1506 m (Figs. 1 & 2). This reserve was previously recognized as three separate reserves, Lutindi, Kilanga and Nkombola FRs (Johansson & Sandy 1996, Hamilton & Bensted-Smith 1989), and this study focused on the Lutindi area. A. Loveridge had previously collected birds at Lutindi in December 1926 (Friedmann 1928), and he was followed by collectors employed by R.E. Moreau, all of whom made brief visits to Kizara and Hundu (Lutindi/Nilo) in July and October 1931, respectively (Sclater & Moreau 1932–33).

The main objective of this study was to assess the biological and conservation importance of this site, and document the status of globally threatened birds. A follow-up survey was made in 1995 (Seddon *et al.* 1995, 1996), the results of which will be published separately.

Description of study area

The East Usambaras rise up from the coast to 1506 m with an extensive submontane plateau between 800–1000 m and are separated from the higher West Usambaras by the Lwengera Valley. Much of the plateau is forested and total forest cover in the East Usambaras comprises about 45 000 ha, a figure that includes poorly stocked forest and woodland (Johansson & Sandy 1996). This once extensive forest now exists as fragmented blocks due to human activities over the last 2000 years (Schmidt 1989, Newmark 1993). This has been especially so since the late 1800s due to the clearing for colonial estates and subsequently for tea and sisal estates, some commercial logging and, more recently, shifting cultivation (e.g. Rodgers & Homewood 1982, Hamilton & Bensted-Smith 1989, Tye 1993, M. I. L. Katigula & S. Johansson *in litt.* 1997).

The climate, soil types and sub-montane/montane forest of Nilo FR have been described in detail elsewhere (Moreau 1935, Hamilton 1989a, b, Hamilton *et al.* 1989, AFIMP 1987, Johansson & Sandy 1996).

Methods

Nilo FR was visited from 2–12 August 1994 and again on 10 October 1996. Effort was concentrated in the area previously known as Lutindi FR (see Hamilton & Bensted-Smith 1989, AFIMP 1987). Methods were designed to locate as many species as possible in the time available, especially targeting those species of conservation concern. Audio-visual observation and mist-netting were conducted daily: audio-visual observation served the purpose of locating as many species as possible in a variety of habitats and elevations whereas mist-netting enabled the capture of the more elusive understorey birds. Jacob Kiure (one of the team members) and I rotated between direct observation and netting every 3–4 h and occasionally closed the nets to allow for bird-watching walks.

Four mist-net sites were established in Nilo FR or in the adjacent Public Land forest (Fig. 2). Site 1, with 19 nets, was in dense forest at 1350 m near a river; the canopy varied from 25–40 m and the understorey was dense, with *Dracaena* sp. predominating. Eight nets were set at Site 2, which was in dense ridge-top forest near the Mt Nilo

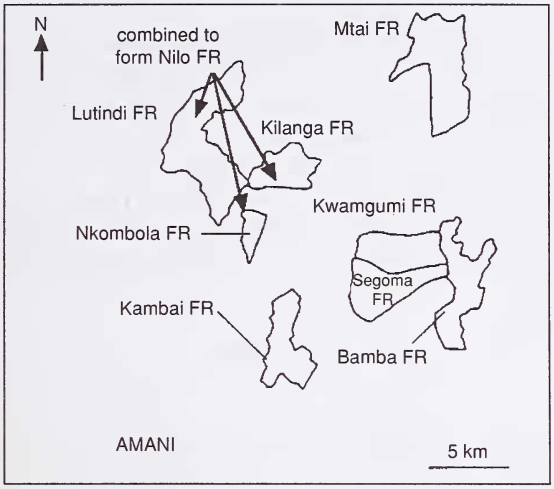

Figure 1. Location of northern forest reserves in the East Usambaras, not including those near Amani (after Hamilton & Bensted-Smith 1989). The three forest reserves that now form Nilo FR are shown but the actual boundaries of this reserve are not shown

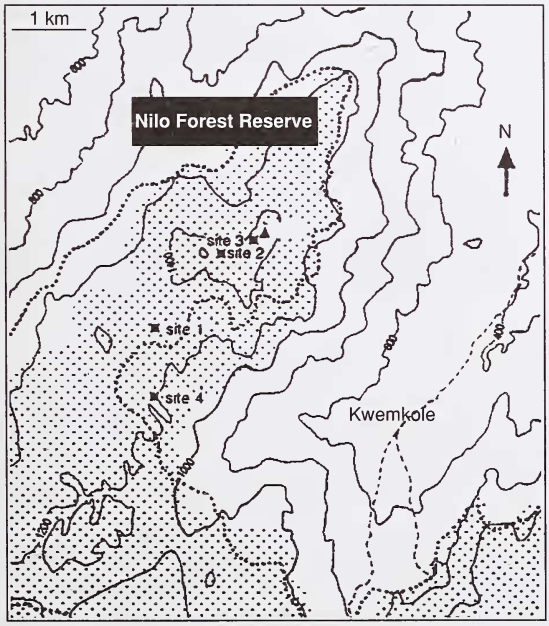

Figure 2. Location of mist net sites in Nilo FR. Stippled indicates forest cover; dashed line, vehicle road; dotted line, forest reserve boundary

summit at 1400 m; canopy height ranged from 20–30 m. The third site, with 10 nets, was at the summit (1500 m); the understorey was thin but the canopy (15–25 m) was closed in most places. Site 4 (1250 m) consisted of 8 nets in very disturbed Public Land forest where much of the undergrowth was affected by the grazing of livestock; trees varied from 15–40 m, some even taller. Lianas, epiphytes, mosses and lichens were especially common above 1300 m in good forest.

The nets were operated from dawn to dusk and birds removed at half-hour or hour intervals depending on the capture rates. All birds were ringed with East African Ringing Scheme rings, standard biometric measurements were taken and moult and brood patch scores noted.

Results

Species list

Sixty-nine of the 94 possible species from Stuart's (1989) list were recorded at Nilo FR (Table 1): most of those not recorded were species of lower altitudes. Thirty-four out of a possible 36 East Coast Escarpment montane forest species that occur in the East Usambaras, according to the list of Stuart *et al.* (1993), were recorded. Non-forest species recorded during this study are indicated in Appendix 1.

Table 1. List of all forest-dependent species recorded in or near Nilo FR. Altitudes of all observations are given here. Where appropriate, the percentage of captured individuals in breeding condition (with fresh, fully developed and vascularized brood patches (BP) of 4 or 5) is indicated. Systematics and nomenclature follow Zimmerman *et al.* (1996)

Species	Altitude (m)	Comments
African Goshawk *Accipiter tachiro*	below 1350	
African Crowned Eagle *Stephanoaetus coronatus*	below 1500	
Mountain Buzzard *Buteo oreophilus*	900–1500	
African Harrier Hawk *Polyboroides typus*	below 1150	
Southern Banded Snake Eagle *Circaetus fasciolatus*	1100–1350	
Ayres's Hawk Eagle *Hieraaetus ayresii*	1100–1500	
Scaly Francolin *Francolinus squamatus*	1000	found in thickets outside forest
African Green Pigeon *Treron calva*	below 1100	
Lemon Dove *Aplopelia larvata*	1100–1500	
Olive Pigeon *Columba arquatrix*	1350	
Bronze-naped Pigeon *C. delegorguei*	1000–1500	
Tambourine Dove *Turtur tympanistria*	1000–1500	
Fischer's Turaco *Tauraco fischeri*	1000–1500	
Barred Long-tailed Cuckoo *Cercococcyx montanus*	1200	
Emerald Cuckoo *Chrysococcyx cupreus*	1200	
Yellowbill *Ceuthmochares aereus*	1200	
Usambara Eagle Owl *Bubo vosseleri*	1250–1350	
African Wood Owl *Strix woodfordii*	1200	only one record; 1994
Bar-tailed Trogon *Apaloderma vittatum*	1200–1500	
Silvery-cheeked Hornbill *Bycanistes brevis*	900–1500	
Trumpeter Hornbill *B. bucinator*	below 1200	
White-eared Barbet *Buccanodon leucotis*	1000–2250	
Green Barbet *B. olivaceum*	1000–1500	

Species	Altitude (m)	Comments
Moustached Green Tinkerbird *Pogoniulus leucomystax*	1000–1500	
[Golden-tailed Woodpecker *Campethera abingoni* or Mombasa Woodpecker *C. mombassica*	1200	sufficient characteristics to distinguish the two species were not obtained; however, see Seddon *et al.* (1995, 1996)]
Cardinal Woodpecker *Dendropicos fuscescens*	1100–1200	
Olive Woodpecker *D. griseocephalus*	1000–1350	
African Broadbill *Smithornis capensis*	1200–1350	
Green-headed Oriole *Oriolus chlorocephalus*	1000–1300	
Black Saw-wing *Psalidoprocne holomelas*	600–1350	
Pale-breasted Illadopsis *Illadopsis rufipennis*	1350	33.3% in breeding condition
African Hill Babbler *Pseudlcippe abyssinica*	1250–1350	
Square-tailed Drongo *Dicrurus ludwigii*	1200–1500	
Black Cuckoo-shrike *Campephaga flava*	1350	
Grey Cuckoo-shrike *Coracina caesia*	1100–1500	
Stripe-cheeked Greenbul *Andropadus milanjensis*	1000–1500	6.7% in breeding condition
Shelley's Greenbul *A. masukuensis*	1000–1500	7.5% in breeding condition; begging juv observed in 1996
Little Greenbul *A. virens*	1250–1500	
Cabanis's Greenbul *Phyllastrephus cabanisi*	1000–1500	20% in breeding condition
Tiny Greenbul *P. debilis*	1000–1400	race *albigula*: 12.5% in breeding condition
Yellow-streaked Greenbul *P. flavostriatus*	1100–1500	40% in breeding condition
White-chested Alethe *Alethe fuelleborni*	1250–1350	
Spot-throat *Modulatrix stictigula*	1250–1500	
White-starred Forest Robin *Pogonocichla stellata*	1100–1500	
Sharpe's Akalat *Sheppardia sharpei*	1000–1500	5% in breeding condition
Olive Thrush *Turdus olivaceus*	1250–1500	
Orange Ground Thrush *Zoothera gurneyi*	1250–1500	
Black-headed Apalis *Apalis melanocephala*	1000–1500	
Long-billed Apalis *A. moreaui*	1200–1250	
Bar-throated Apalis *A. thoracica*	1200–1500	25% in breeding condition
Evergreen Forest Warbler *Bradypterus lopezi*	1000–1500	
Grey-backed Camaroptera *Camaroptera brachyura*	below 1250	100% in breeding condition
Red-capped Forest Warbler *Orthotomus metopias*	1000–1500	75% in breeding condition
[Southern Hyliota *Hyliota australis*	900–1200]	uncertain identity due to inadequate observations; however, see Seddon *et al.* (1995)
Yellow-throated Woodland Warbler *Phylloscopus ruficapilla*	1100–1500	3% in breeding condition
Dusky Flycatcher *Muscicapa adusta*	600–1250	
Forest Batis *Batis mixta*	1100–1350	
Pale Batis *B. soror*	below 1300	
White-tailed Crested Flycatcher *Trochocercus albonotatus*	1000–1500	14.3% in breeding condition
Paradise Flycatcher *Terpsiphone viridis*	below 1300	
Black-fronted Bush Shrike *Malaconotus nigrifons*	1000–1500	
Waller's Starling *Onychognathus walleri*	1000–1500	
Kenrick's Starling *Poeoptera kenricki*	1000–1500	
Collared Sunbird *Anthreptes collaris*	1000–1250	
Uluguru Violet-backed Sunbird *A. neglectus*	1000–1250	

Species	Altitude (m)	Comments
Amani Sunbird *A. pallidigaster*	1000	October 1996
Banded Green Sunbird *A. rubritorques*	1000–1350	
Eastern Double-collared Sunbird *Nectarinia mediocris*	1200–1500	33.3% in breeding condition
Olive Sunbird *N. olivacea*	600–1500	30.6% in breeding condition
Yellow White-eye *Zosterops senegalensis*	900–1500	
Dark-backed Weaver *Ploceus bicolor*	1000–1500	
Tanzania Mountain Weaver *P. nicolli*	1250	
Red-faced Crimson-wing *Cryptospiza reichenovii*	1200–1500	14.3% in breeding condition

Mist-netting

Table 2. List of species netted at each site in Nilo FR. Capture rates [number of birds per 5000 net-metre-hours (number/nmh)] are given for comparative purposes

Species	1 (1350 m) *n* (*n*/nmh)	2 (1450 m) *n* (*n*/nmh)	3 (1500 m) *n* (*n*/nmh)	4 (1250 m) *n* (*n*/nmh)	Total *n* (*n*/nmh)
Lemon Dove			1 (1.7)		1 (0.4)
Tambourine Dove			3 (5.2)		3 (1.1)
African Broadbill	1 (0.7)				1 (0.4)
Square-tailed Drongo	1 (0.7)	1 (2.8)			2 (0.7)
Pale-breasted Illadopsis	3 (2.1)				3 (1.1)
African Hill Babbler	2 (1.4)			1 (2.5)	3 (1.1)
Stripe-cheeked Greenbul	7 (4.9)	1 (2.8)	4 (7)	3 (7.6)	15 (5.5)
Shelley's Greenbul	18 (12.7)	10 (27.8)	7 (12.2)	18 (45.5)	53 (19.3)
Little Greenbul			1 (1.7)	14 (35.4)	15 (5.5)
Olive Mountain Greenbul	8 (5.6)	4 (11.1)	2 (3.5)	6 (15.2)	20 (7.3)
Tiny Greenbul	12 (8.4)			12 (30.3)	24 (8.7)
Yellow-streaked Greenbul	1 (0.7)	1 (2.8)		3 (7.6)	5 (1.8)
White-chested Alethe	3 (2.1)			3 (7.6)	6 (2.2)
Spot-throat	4 (2.8)		2 (3.5)	2 (5.1)	8 (2.9)
White-starred Forest Robin			1 (1.7)	1 (2.5)	2 (0.7)
Sharpe's Akalat	8 (5.6)	4 (11.1)	3 (5.2)	5 (12.6)	20 (7.3)
Northern Olive Thrush	1 (0.7)	1 (2.8)	2 (3.5)		4 (1.5)
Orange Ground Thrush			1 (1.7)	1 (2.5)	2 (0.7)
Bar-throated Apalis	5 (3.5)	3 (8.3)			8 (2.9)
Evergreen Forest Warbler	4 (2.8)			3 (7.6)	7 (2.5)
Grey-backed Camaroptera				1 (2.5)	1 (0.4)
Red-capped Forest Warbler	2 (1.4)	3 (8.3)		3 (7.6)	8 (2.9)
Yellow-throated Woodland Warbler	12 (8.4)	7 (19.4)	2 (3.5)	4 (10.1)	25 (9.1)
Forest Batis				2 (5.1)	2 (0.7)
White-tailed Crested Flycatcher	8 (5.6)	2 (5.6)	3 (5.2)	1 (2.5)	14 (5.1)
Collared Sunbird				3 (7.6)	3 (1.1)
Eastern Double-collared Sunbird	2 (1.4)		3 (5.2)	1 (2.5)	6 (2.2)
Olive Sunbird	12 (8.4)	13 (36.1)	4 (7)	7 (17.7)	36 (13.1)
Red-faced Crimsonwing	4 (2.8)			3 (7.6)	7 (2.5)

We ringed 304 birds of 29 species at Nilo FR in 13 746 net-metre-hours (see Table 2). The most frequently captured group of birds were the bulbuls. Sharpe's Akalat, Yellow-throated Woodland Warbler, White-tailed Crested Flycatcher and Olive Sunbird were also relatively abundant.

Red Data Book species

Twelve threatened or near-threatened species are listed by Collar *et al.* (1994) for the East Usambaras. An additional four restricted-range species occurring in the Tanzania-Malawi mountains Endemic Bird Area are also known from there (Stattersfield *et al.* in prep). Of these, we recorded six threatened or near-threatened and all four restricted-range species in 1994 (Table 3). The Amani Sunbird was added in 1995 by Seddon *et al.* (1996) and I recorded it again in 1996. Four of the five threatened or near-threated species known from the East Usambaras which were not recorded from the Lutindi area of Nilo FR (Sokoke Scops Owl *Otus ireneae*, Swynnerton's Forest Robin *Swynnertonia swynnertoni*, East Coast Akalat *Sheppardia gunningi* and Plain-backed Sunbird *Anthreptes reichenowi*) are currently known only from lowland forests below 550 m (Tye 1993, Evans *et al.* 1994, Hipkiss *et al.* 1994, Cambridge Tanzania Rainforest Project 1994, Cordeiro & Githiru in prep.). These species may conceivably occur in the low altitude forest in the Nkombola part of Nilo FR. The fifth, possibly overlooked, species is the elusive Dappled Mountain Robin *Modulatrix orostruthus*, known only from about 900-1100 m at Amani (Collar & Stuart 1985, Stuart 1989) and up to *c.* 1700 m in the Ndundulus and Nyumbanitus, Udzungwas (Dinesen *et al.* 1993).

Table 3. Status of globally threatened and restricted-range species occurring in the East Usambaras and recorded during this study

Species	Category*	Presence at Nilo FR
Southern Banded Snake Eagle *Circaetus fasciolatus*	nt	x
Fischer's Turaco *Tauraco fischeri*	nt*	x
Sokoke Scops Owl *Otus ireneae*	v*	
Usambara Eagle Owl *Bubo vosseleri*	v*	x
Swynnerton's Robin *Swynnertonia swynnertoni*	v*	
East Coast Akalat *Sheppardia gunningi*	v	
Sharpe's Akalat *S. sharpei*	*	x
Dappled Mountain-Robin *Modulatrix orostruthus*	v*	
Spot-throat *M. stictigula*	*	x
Long-billed Apalis *Apalis moreaui*	c*	x
Red-capped Forest Warbler *Orthotomus metopias*	*	x
Kenrick's Starling *Poeoptera kenrickii*	*	x
Amani Sunbird *Anthreptes pallidigaster*	v*	1996
Plain-backed Sunbird *A. reichenowi*	nt	
Banded Green Sunbird *A. rubritorques*	v*	x
Tanzania Mountain Weaver *Ploceus nicolli*	v*	x

Categories: c = critical; v = vulnerable; nt = near-threatened (after Collar *et al.* 1994);
* species of globally restricted range (Stattersfield *et al.* (in prep.)).

Long-billed Apalis *Apalis moreaui* — Critical

Sclater (1931a) described this species from the type, obtained near Amani in 1930. This rare species, which can be very difficult to locate (Stuart 1989, *in litt.*), was apparently not recorded there again until 1972 by R. J. Stjernstedt (in Collar & Stuart 1985) and subsequently by Stuart & Hutton (1978), Turner (1978) and Britton *et al.* (1984). Stuart & Hutton (1978) netted an individual at the forest edge and obtained other records of it in dense vines, occasionally some distance from the forest. They also twice observed it in mixed feeding parties. Tye (in Collar *et al.* 1994) did not observe it (but may have heard it) in four years at Amani and the only recent documented record is that of B. W. Finch (in Collar *et al.* 1994), who located a male at Monga Tea Estate in 1992.

This species was observed twice on 11 August in the Lutindi area, barely outside Nilo FR in very disturbed Public Land forest. The first record (1200 m) was of a bird foraging alone in the dense tangles of a tree about 3–4 m off the ground at about 12:30, just after a short shower of rain. The second individual was observed at about 16:00, close to a ridge in a disturbed glade at 1250 m. It was watched gleaning invertebrates from a clump of shrubs at ground-level in direct sunlight for several minutes, approximately 3–5 m from me. Both observations contradict the statement of Sclater & Moreau (1932–33) that the species is not found in sunlit places, but are not incompatible with those of Stuart & Hutton (1978).

Physical features that helped distinguish this species from the local grey-headed form of Black-headed Apalis included the shorter tail, faint wash of brown on the greyish wings, brown tinge on the forehead and the rather thin, long bill. The behaviour of both individuals (alone in understorey vegetation, foraging by gleaning the tangles and foliage) is also indicative of this species.

Seddon *et al.* (1995, 1996) visited this area but did not record this species at Nilo FR in 1995. This suggests that it is either extremely rare or very elusive in Nilo FR and elsewhere in its range.

Usambara Eagle Owl *Bubo vosseleri* — Vulnerable

This rare owl is known from only a few sites in the East and West Usambaras (Collar *et al.* 1994) and, more recently, from the Uluguru mountains (Hunter *et al.* 1996). There is also a possible sighting in the Ngurus (J. G. Williams in Moreau 1964). It is an elusive forest species, not recorded at Amani until 1969–73 (White 1974) and first recorded in the West Usambaras in 1970 (Stuart & Hutton 1978). An individual was captured at Kwamkoro FR (near Amani) in August 1993 (W. D. Newmark *in litt.*). The total population was estimated at roughly 500 pairs in 1985 (Collar & Stuart 1985), but is most likely higher due to the recent discovery of populations in three East Usambara lowland forest sites (Cambridge Tanzania Rainforest Project 1994, Evans *et al.* 1994, Evans 1997).

What was believed to be this species was recorded at Nilo FR on 9–10 August (1250–1350 m), where it called every 2–5 min from dense forest after dusk and from about 04:30–05:45. Jacob Kiure, who was familiar with its call (see Evans *et al.* 1994),

confirmed it as identical to that heard in the lowlands in 1992. I agree with Evans *et al.* (1994) that "there must remain a small degree of doubt that the call is of this species until a calling bird is seen and tape-recorded simultaneously."

Tanzanian Mountain Weaver *Ploceus nicolli* — Vulnerable

The type specimen of this forest weaver, which ranges from 900–2200 m in the Eastern Arc forests, was collected from Amani in the East Usambaras (Sclater 1931b). It was subsequently recorded in the West Usambaras (Sclater & Moreau 1932–33, Ripley & Heinrich 1966, Turner 1978, Stuart & van der Willigen 1979, Britton *et al.* 1984).

The Uluguru and Udzungwa subspecies *anderseni* was first collected by T. Andersen in May 1952 (Franzmann 1983); further records are summarized in Collar *et al.* (1994). There is a possible recent record from the Rubeho Mountains (Fjeldså & Rabøl 1995).

A pair was seen outside the Nilo FR on 3 August at 1250 m in disturbed forest which formed part of the Public Land. They were gleaning epiphytes, as described by Dinesen *et al.* (1993), in the canopy some distance from a mixed-species flock. The second sighting was of four birds on 11 August along a ridge not far from the original location. All four were perched in the canopy and observed through a 15–60x telescope. In neither sighting was the species part of a mixed-species flock (see also Dinesen *et al.* 1993) although other observers have noted them participating in such flocks (Turner 1978, Stuart & van der Willigen 1979, Britton *et al.* 1984, Stuart *et al.* 1987). Seddon *et al.* (1995, 1996) also found this species in Nilo FR in a follow-up visit.

These records from Mt Nilo are the first from the East Usambaras in over 60 years (Cordeiro 1995), confirming Stuart's (1989) prediction that it might occur at Nilo FR. Given the lack of previous observations, it appears to exist at very low densities (see also Collar *et al.* 1994). It is therefore of utmost importance to safeguard the entire montane forest at Nilo.

Banded Green Sunbird *Anthreptes rubritorques* — Vulnerable

This sunbird is known from a number of Eastern Arc mountains, including the Usambaras, Ulugurus, Ngurus and Udzungwas (Collar *et al.* 1994). It is common in the East Usambaras and the south-western section of the West Usambaras, but scarce elsewhere in its range (Collar & Stuart 1985, Collar *et al.* 1994). At Amani, it was frequently located at the forest edge and sometimes adjacent cultivation (Turner 1978, Collar & Stuart 1985); it has recently been reported at low altitude, 200 m, in the East Usambaras (Hipkiss *et al.* 1994, Cambridge Tanzania Rainforest Project 1994). Evans (1997) noted it breeding at 300 m.

In 1994, at least 25 observations, involving perhaps eight males and five females, were made of this sunbird in the disturbed Public Land forest, especially near the forest edge or in large glades. It was encountered from 1000–1250 m and only once observed at 1350 m in the reserve. Seddon *et al.* (1995, 1996) also recorded it at Nilo FR in a follow-up survey. In 1996, a flock of about 10–15 individuals was located

feeding in a large flowering tree within the same area (see next species).

Amani Sunbird *A. pallidigaster*—Vulnerable

Seddon *et al.* (1996) first recorded this bird in the reserve in 1995; I did not find it in 1994. At least two males were observed in 1996 feeding alongside Banded Green Sunbird, Olive Sunbird, Stripe-cheeked Greenbul, Shelley's Greenbul, White-tailed Crested Flycatcher and Yellow White-eye in a flowering tree along a ridge in Public Land forest.

Southern Banded Snake Eagle *Circaetus fasciolatus* — Near-threatened

This species has a wide but localized distribution in coastal forest from Somalia to South Africa (Collar *et al.* 1994). It is common in the East Usambaras (Moreau 1935, Collar & Stuart 1985, Tye 1993), where there are recent reports of it breeding in the lowlands (Hipkiss *et al.* 1994, Cordeiro & Githiru in prep.). It was recorded at 1250 m and 1350 m in 1994.

Fischer's Turaco *Tauraco fischeri* — Near-threatened

Although quite common in the East Usambaras, it is apparently rare in the outlying Mt Mtai (Evans & Anderson 1992). At Nilo FR, it was frequently encountered from 1000–1500 m where it fed in the forest mid-storey and canopy.

Spot-throat *Modulatrix stictigula*—Restricted-range

This species was considered common in the East Usambaras in the 1930s (Sclater & Moreau 1932–33). Britton (1980), mentioned its decline there, probably basing this comment on the observations of Stuart & Hutton (1978) and Turner (1978), who suggested competition with *M. orostruthus* as the cause. The fact that both species occur sympatrically in the Udzungwas (Jensen & Brøgger-Jensen 1992, Dinesen *et al.* 1993) weakens this suggestion. A likelier explanation is forest loss in the Amani area, the best-surveyed part of the East Usambaras, over the years. Newmark (*in litt.* 1995, see also Newmark 1991), who has studied this species at Monga near Amani since 1987, observes that it is highly sensitive to forest degradation.

It was quite common at Lutindi, Nilo FR, where eight individuals were ringed and several more heard. Although capture rates indicate that this species was relatively common in disturbed forest (see Table 2), these results are potentially misleading because additional individuals were caught but escaped from the nets at sites 1–3. It appeared to be especially abundant in the wet, undisturbed forest where more individuals were heard calling than in the disturbed forest of the Public Land.

Sharpe's Akalat *Sheppardia sharpei* — Restricted-range

An abundant species from 1000–1500 m and somewhat tolerant of habitat disturbance (see Table 2).

Red-capped Forest Warbler *Orthotomus metopias* — Restricted-range

The most recent East Usambara records of this warbler are those of Newmark (1991) who netted only two birds in more than 59 000 net-metre-hours in July 1987. Stuart

(1981) implied that the rarity of this species in the East Usambaras is probably due to the presence of *A. moreaui*, with which he felt it shared a very similar niche. This idea has yet to be substantiated, but both species occurred sympatrically at about 1250 m in disturbed forest at Nilo FR. A likelier explanation is that the Amani plateau is too low for this species (Stuart & Hutton 1978), which usually occurs at higher altitudes. It was quite common at Lutindi, especially in the moist forest above 1400 m where there were dense clumps of tree ferns *Cyathea* sp. Jensen & Brøgger-Jensen (1992) also noted a habitat preference for *Cyathea* sp. at Chita Forest in the Udzungwas.

Kenrick's Starling *Poeoptera kenricki* — Restricted-range

Often encountered from 1000–1500 m, sometimes in single-species flocks and occasionally with Waller's Starlings.

Other notable records

Ayres's Hawk-Eagle *Hieraaetus ayresii*

Seen infrequently from 1200–1500 m flying over forest in 1994 and observed once in 1996.

Green-headed Oriole *Oriolus chlorocephalus*

Commonly observed below 1300 m where it regularly joined mixed-species flocks; known to occur as high as 1800 m at Mwanihana in the Udzungwas (Stuart *et al.* 1981).

African Hill Babbler *Pseudalcippe abyssinica*

This species had not previously been recorded in the East Usambaras. Three birds were netted in 1994, one at 1250 m and a pair at 1350 m. It was not heard to call at Nilo FR. Seddon *et al.* (1995, 1996) also recorded it at Nilo FR in a follow-up survey.

Tiny Greenbul *Phyllastrephus debilis*

Fairly abundant in disturbed forest in the Public Land but also ranged up to 1400 m in primary forest. It was absent or overlooked in the ridge-top forest. Stuart & Hutton (1978) netted 24 individuals in primary forest and only four from the forest edge; they thus suggested that this species was reduced in density in secondary forest. Mist-netting results at Nilo FR indicate that this may not necessarily be true as the species had a higher capture rate in disturbed forest compared to primary forest (see Table 2).

White-chested Alethe *Alethe fuelleborni*

Netted in fair numbers in both disturbed forest in the Public Land and at 1350 m near a stream. Not recorded in ridge-top forest although possibly present there. Apparently scarce at Mt Mtai (Evans & Anderson 1992) but commonly recorded in forest elsewhere in the East Usambaras.

White-starred Forest Robin *Pogonocichla stellata*

The results suggest that it occurs at very low densities on Mt Nilo. Although frequent elsewhere in the East Usambaras, this robin was not recorded at Mtai (Evans &

Anderson 1992). Seasonal movements down the mountain (see Stuart 1989) during my cold-season study period may have contributed to the few records of this species at Lutindi.

Black-throated Wattle-Eye *Platysteira peltata*

Evans (1997) listed his records of 1995 as being the first published ones for the East Usambaras since those of Sclater & Moreau (1932–33); however, Newmark (1991) makes a brief mention of netting the species in the Amani area. I observed a pair in dense vegetation along a stream above Kwemkole at about 700 m in 1996.

Uluguru Violet-backed Sunbird *Anthreptes neglectus*

This species ranges from sea-level to about 1200 m in the East Usambaras (Stuart 1989) where it is an apparently uncommon forest bird (Stuart & Hutton 1978). Apart from several coastal and inland sites in Kenya and Tanzania where it exists at low altitudes, this species is also known from 1400 m in the Ndundulus, Udzungwa Range (Dinesen *et al.* 1993).

At Nilo FR, it was seen a total of at least 6 times at 1200–1250 m in 1994 and once at 1000 m in 1996. It was observed in the forest canopy in disturbed forest of the Public Land, and once feeding in the shrub layer.

Discussion

Altitudinal effects

Moreau (1935) briefly commented on the avifaunal affinities that the Nilo (Hundu) area shared with the West Usambaras. Several East African montane species are known from both the East and West Usambaras, only above 900–1000 m, but especially above 1200 m, such as at Nilo FR. Spot-throat, Bar-throated Apalis, Red-capped Forest Warbler and Eastern Double-collared Sunbird were reasonably common in the Lutindi area, where the higher altitude may have provided better conditions for them than the lower plateau in the Amani area. Comparative capture rates from both areas are only available for Spot-throat and Red-capped Forest Warbler: in relatively undisturbed forest at Monga (near Amani) both species had capture rates of 0.25 and 0.17 birds per 5000 nmh, respectively (Newmark 1991, *in litt.* 1995). These capture rates are substantially lower than those at Nilo FR. Although only a few observations of African Hill Babbler and Tanzania Mountain Weaver were obtained at Nilo FR, the presence of both at higher altitudes supports the belief that these species are probably montane inhabitants, as has been found elsewhere in the Eastern Arc (e.g. Jensen & Brøgger-Jensen 1992, Stuart *et al.* 1993).

Biodiversity values

Three near-endemics (Usambara Eagle Owl, Sokoke Scops Owl, Long-billed Apalis) are listed for the East Usambaras: the eagle owl and apalis were recorded from the Lutindi area. Moreover, four additional restricted-range species were located at Nilo FR.

The presence of seven globally threatened and near-threatened species, as well as the restricted-range species, indicates the importance of this site for the conservation of the biodiversity in the East Usambaras. The high species richness of East African montane avifauna at Nilo FR adds to the biological value of this unique habitat in the East Usambaras.

Forest cover, threats and local uses

Nilo FR is the only area in the East Usambaras with forest which, although mainly submontane, approaches that of the montane type found in the West Usambaras and elsewhere in the Eastern Arc at higher altitudes (above *c.* 1200 m). The reserve itself is divided into several land-use categories (see Table 4) but these figures do not include the forest in the Public Land.

Although much of the forest above 1300 m on the eastern and northern slopes in the Lutindi area appears to be intact, there was some pit-sawing activity in both the forest reserve and the Public Land forest below and adjoining the reserve in 1994 (see also Seddon *et al.* 1995, 1996). Planks were seen being transported by foot from both the forest reserve and the Public Land forest and it was therefore difficult for the forest rangers to trace the exact source of this lumber. This activity has apparently been curbed in the reserve (M. I. L. Katigula & S. Johansson *in litt.* 1997, C. Ndakidemi & R. Muna, pers. comm.) but evidence of it in the Public Land was still prevalent in 1996. Nevertheless, pit-sawing was temporarily banned in the East Usambaras (A. Tye, pers. comm. 1995) making such activity illegal whether it takes place in the Public Land forest or the forest reserve. Pole cutting, mainly of saplings for the framework of mud-huts, takes place in both the reserve and public land, and could interfere with the forest ecology (see also Seddon *et al.* 1995, 1996).

In addition, cannabis and cardamom growers were encroaching on the forest reserve as was evident during our visit in 1994 when several farm plots in the adjoining Public Land forest and forest reserve, totaling almost 120 ha, were burnt by the EUCFP forest rangers and local police who were trying to prevent such activity. Efforts to control this activity in the forest reserve are ongoing (M. I. L. Katigula & S. Johansson *in litt.*). Moreover, fires that went unchecked east of the summit were evident in 1996. These fires, mostly employed to remove ground vegetation so that fields can be cultivated, appeared to have ventured just inside the forest reserve.

The Public Land forest, pockets of which are located below the forest reserve, acts as a buffer zone where cultivation and limited usage of forest resources is permitted. Since 1994, rapid changes have occurred due to the increased demand for agricultural land. At least 20 acres of newly cultivated cardamom plots were noted in the Public Land in 1996. This form of cultivation involves the removal of most of the forest undergrowth and forest cannot regenerate during the cultivation of this crop (Hamilton & Mwasha 1989). Another factor that possibly hinders forest regeneration in the Public Land is livestock grazing. Sheep, cattle and goats were observed in 1994 and 1996 in the Public Land forest, which serves as the only close source of fodder since the

slopes have been denuded in favour of subsistence farm plots. The pressure on the reserve could soon build up when the undergrowth in the Public Land is depleted.

Most of the rare birds were located in the Public Land forest and it is possible that with increased human activities in the area, many of these globally threatened birds could face local extinction. It should be noted that some of the rare species, like the Long-billed Apalis, do occur in secondary forest (Stuart 1981); however, others may be negatively affected if the forest in this area is degraded to the point where very few trees exist. Severe degradation of this habitat would most likely affect species that survive at low densities like the Tanzania Mountain Weaver and Usambara Eagle Owl.

Table 4. Land-use categories in Nilo FR (based on Johansson & Sandy 1996)

Forest type/land-use	area (ha)	%
Submontane forest		
Dense forest	1670.7	28.5
Cultivation under forest	1738.1	29.6
Lowland forest		
Dense forest	1190.3	20.3
Poorly stocked forest	356.1	6.1
Cultivation under forest	335.8	5.7
Bush	169.7	2.9
Peasant cultivation	372.3	6.3
Barren land	37.2	0.6
Settlement	1.9	0.0
Area of reserve	5872.1	

Conservation efforts and recommendations

Prior to the 1990s, forest cover in the East Usambaras was being lost at a great rate due to the different human-related activities described above (see Hamilton & Bensted-Smith 1989). The East Usambara Catchment Forest Project (EUCFP) has improved the overall situation in the East Usambaras by curbing many of the most detrimental causes of forest destruction. Prior to 1993, a significant portion of the forest remained with no formal protection but the efforts of EUCFP to incorporate much of this into forest reserves is commendable. Nilo FR is a prime example of this effort. Prior to 1994, it consisted of three separate forest reserves (Lutindi, Kilanga and Nkombola) with a total area of 3142 ha. By 1996, the area of Nilo FR increased to 5872 ha which included a significant additional portion of lowland and submontane forest. However, the lack of any jurisdiction over the exploitation of the adjacent Public Land forest threatens the long-term prospects for this reserve. The forest needs a coordinated management scheme in the near future. If the villagers can be compensated, gazetting additional forest from the Public Land and other unprotected forest patches in the area into the existing reserve could serve as buffer zones for the larger and more extensive montane forest. This would give the forest a reasonable future, especially if farming is

prohibited in the more vulnerable sections of this mountain range. The local population should be allowed into such zones to obtain forest products only under carefully controlled conditions.

It is unclear how detrimental pole cutting may be to the forest and further studies on the number of small trees cut per year in relation to forest degradation are needed, especially as the population of nearby villages continues to grow. Mounting pressure on the reserve itself may build up when the combination of pole-cutting and pit-sawing with livestock grazing and cannabis/cardamom cultivation in the Public Land destroys the forest undergrowth. Protection of this forest will conserve not only these rare birds and other fauna and flora, but also the rivers that run through this reserve and provide for the villages and farms below. Degradation or removal of this forest will severely affect the hydrology of this catchment area, important for the northern sector of these highlands (Bruen 1989).

Further surveys in this area are also required. The forested Kilanga area has already been surveyed (Seddon *et al.* 1996), and surveys should also be made in the low altitude forest at Nkombola, where populations of threatened lowland specialists may well occur, as found in similar sites in this area (Evans & Anderson 1992, 1993, Evans *et al.* 1994, Hipkiss *et al.* 1994).

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